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Case Report

Anesthetic Management Using Epidural Anesthesia Combined with Ultrasound-Guided Serratus Plane Block for Breast Surgery of Two Patients with Severe Respiratory Disorder

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ABSTRACT

Background: Regional anesthesia is recommended for the anesthetic management of patients with low respiratory function undergoing mastectomy. We present two cases of breast surgery under thoracic epidural anesthesia in combination with ultrasound-guided serratus plane block (SPB) and intravenous sedation. General anesthesia was considered difficult to induce in these patients because of their underlying respiratory condition.

Case presentation: Patient 1 was a 40-year-oldfemalewho underwent a partial phyllodes tumor resection. She had muscular dystrophy, diabetes mellitus, and allergic reaction to non-steroidal anti-inflammatory drugs and acetaminophen. We combined epidural anesthesia with SPB and inhalation of nitrous oxide and 0.5%-1.0% sevoflurane via a face mask under spontaneous breathing. Patient 2 was a 66-year-old woman who underwent an early breast cancer resection. She had severe bronchial asthma, hypertension, and glaucoma. Because the patient had chronic obstructive disorder (COPD) due to asthma, we performed a combination of thoracic epidural block and ultrasound-guided SPB under sedation by sevoflurane inhalation. No adverse event occurred intra operatively in both cases.

Conclusion: A combination of thoracic epidural anesthesia and SPB under inhalation of low-concentration sevoflurane was useful for peri-operative anesthetic management in patients with severe respiratory dysfunction. This could be an option for the management of anesthesia in patients with low respiratory function undergoing mastectomy.

Keywords: Thoracic epidural anesthesia; Serratus plane block; Sevoflurane inhalation; Ultrasound guidance; Respiratory dysfunction; Difficult airways; Anesthetic management

INTRODUCTION

Regional anesthesia is recommended for the anesthetic management of patients undergoing mastectomy. Several reports have described the usefulness in peri-operative management of general anesthesia in combination with regional anesthesia for breast surgery of patients with severe respiratory dysfunction. However, some patients cannot undergo general anesthesia under airway management and/or ventilation due to severe respiratory disturbance. Moreover, several reports have indicated that the anesthetic management of regional anesthesia alone is difficult to obtain satiable pain relief. In these cases, the combination of regional anesthesia and sedation may be useful for anesthetic management.

Herein, we induced thoracic epidural anesthesia in combination with serratus plane block (SPB) [1] and intravenous sedation for breast cancer resection in two females in whom general anesthesia was considered to be difficult because of their limited respiratory functions.

CASE PRESENTATION

This case study was approved by the institutional ethics committee of Dokkyo Medical University, and all procedures

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performed was in adherence to the tenets of the Declaration of Helsinki. We obtained informed consent from our patients for the use and publication of their medical data.

Case 1

A 40-year-old woman (weight-71 kg; height-163 cm) was scheduled for a partial resection of a giant phyllodes tumor of the breast. The tumor was benign and located at the left lower inner and lower outer quadrant areas, with a diameter of approximately 5 cm. Her medical history included low respiratory function caused by muscular dystrophy, type 2 diabetes, and allergic reaction to non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen. The results of her respiratory function test were as follows: forced expiratory volume in 1s (FEV1.0%) (Gensler)-87%; FEV1.0-1.36 L; V50-3.05 L/sec (78.4%); V25-0.74 L/sec (45.6%); V50/V25-4.12; and % vital capacity (%VC)-48.9%. These findings indicated restrictive ventilator impairment and peripheral airway obstruction caused by muscular dystrophy. Therefore, we predicted possible difficult extubation and planned for a balanced anesthetic approach with combined thoracic epidural anesthesia, ultrasound-guided SPB, and inhalation of anesthetics. After the insertion of an epidural catheter at the T4-5 interspace, we injected 7 mL of 1% mepivacaine. Subsequently, after confirming analgesia, we performed a left SPB with 10 mL of 0.25% levobupivacaine. Intra operative sedation was achieved by inhalation of nitrous oxide and 0.5-1.0% sevoflurane via a face mask under spontaneous breathing. The surgical procedure was pain-free, and no adverse respiratory event occurred intra operatively. For postoperative pain relief, we performed continuous epidural analgesia with 0.2% ropivacaine (3 mL/hour) from end of surgery period to one day after surgery. Severe postoperative pain was not reported until postoperative day one, and she was discharged without complaining of severe pain.

Case 2

A 66-year-old woman (height-156 cm; weight-60 kg) was diagnosed with early stage breast cancer at the left upper inner and upper outer quadrant areas of the breast, with a diameter of approximately 1 cm. She was scheduled for a partial tumor resection. Her medical history included severe bronchial asthma, hypertension, and glaucoma. Although she was treated with oral steroid, transdermal and inhaled long-acting-β 2-agonist, she continued to experience more than one asthma attack a month. Her respiratory function test results were as follows: FEV1.0% (Gensler)-64%; FEV1.0-1.02 L; V50-0.71 L/sec (26.1%); V25-0.3 L/sec (32%); V50/V25-2.7; %VC-63.6%; maximal mid-expiratory flow-0.62 L/sec; and fractional exhaled nitric oxide-58.4 ppb. These findings indicate chronic obstructive disorder (COPD) caused by asthma. Therefore, we planned to induce a balanced anesthesia with a combination of epidural anesthesia, ultrasound-guided SPB, and mild sedation with inhaled 1% of sevoflurane and 50% of nitrous oxide. After insertion of the epidural catheter at the T6-7 interspace, we injected 8 mL of 1% mepivacaine. After confirming analgesia due to epidural anesthesia, we performed aright SPB with 10 mL of 0.25% levobupivacaine. Intra operative sedation was induced by intravenous diazepam (7.5 mg) and inhalation of nitrous oxide and 0.5-1.0% sevoflurane via a face mask under spontaneous breathing. No adverse event occurred intra operatively. For postoperative pain relief, we performed continuous epidural analgesia with 0.2% ropivacaine (3 mL/hour) from end of the surgery period to one day after surgery. Severe postoperative pain was not reported until postoperative day one, and she was discharged without complaint of severe pain.

DISCUSSION

We report the anesthetic management of two cases of mastectomy under inhaled anesthetic sedation with thoracic epidural anesthesia and ultrasound-guided SPB in patients with low respiratory function. Surgical patients with severe respiratory dysfunction are presumed to have a high risk of peri-operative complications [2]. The anesthetic management of such patients involves the risk of intra operative hypoxia, hypercarbia, and difficult extubation due to low respiratory function [3]. Therefore, regional anesthesia is recommended for the anesthetic management of patients with low respiratory function undergoing mastectomy. The anesthetic management of our case avoided intubation and mechanical ventilation because of the predicted risk of postoperative respiratory failure [4].

Hausman et al. [5] reported that the combination of peripheral nerve block and thoracic epidural anesthesia for anesthetic management of patients with severe COPD was associated with a low incidence of postoperative pulmonary complications. Moreover, two case studies have reported the anesthetic management of patients undergoing mastectomy with thoracic para vertebral block and mild sedation [6,7]. These reports further support our present strategy for aesthetic management.

In our cases, we induced sedation and anesthesia with a combination of inhaled anesthetics, thoracic epidural anesthesia, and ultrasound-guided SPB. Although thoracic epidural anesthesia induces anesthesia at the precordial region, but not the axillary area, thoracic epidural anesthesia can block the internal mammary region. However, it is difficult to achieve analgesia in the axillary region with thoracic epidural anesthesia alone. In contrast, the site for SPB injection is between the ventral or dorsal muscles of the anterior serratus muscles, at the level of the axillary line and fourth rib. Pectoral nerve (PECS) blocks, including SPB, are used in combination with general anesthesia as peri-operative analgesics for breast cancer surgery or axillary lymph node dissection. Although SPB has been reported to be a good method for inducing analgesia in the lateral precordial region, SPB alone cannot induce anesthesia.

In our cases, thoracic epidural anesthesia and SPB were used together because thoracic epidural anesthesia might not effective enough to induce analgesia in the axillary region; conversely, SPB alone might be insufficient for anesthesia of the medial precordial region. We chose a low concentration of local anesthetic to induce epidural anesthesia to prevent the relaxation of the respiratory muscles. We used low-concentration sevoflurane for sedation because the expected operation time was short, which obviated the need for long-term sedation with dexmedetomidine, and moreover, sevoflurane acts

as a bronchodilator. Recently, Ueshima et al. [8] reported that the PECS block cannot block most of the internal mammary region, whereas a transversus thoracic muscle plane (TTP) block achieves this effect. A combination of PECS and TTP blocks is superior to our method of anesthetic management for the mastectomy of patients with severe cardiopulmonary illness. Although thoracic epidural anesthesia can cause a reduction in VC and FEV1.0 can be induced by, these effects are marginal and the beneficial effects can lead to an improvement in postoperative lung function, postoperative pain, and postoperative diaphragmatic function [9]. Therefore, we emphasize that our anesthetic approach may be superior because of the need for low concentration of local anesthetics and ease in inducing postoperative analgesia using continuous epidural analgesia. Furthermore, thoracic epidural analgesia uses a low concentration of anesthetic such as 1% mepivacaine, which does not affect the respiratory functions. In additionally, thoracic epidural analgesia can relieve the postoperative pain by continuous infusion of local anesthetics and/or several analgesics. Because our case 1 had an allergic reaction to NSAIDs, postoperative thoracic epidural analgesia was an important option for the postoperative pain management. In fact, postoperative thoracic epidural infusion with 3 mL/hour of 0.2% ropivacaine was useful for pain relief in our case 1.

LIMITATION OF THE STUDY

One limitation is that we did not assess the analgesic area after epidural infusion.

CONCLUSION

We described our experience with the anesthetic management of 2 cases of partial breast resection for patients with low respiratory function. In this report, we emphasized that thoracic epidural anesthesia in combination with ultrasound-guided serratus plane block (SPB) and intravenous sedation was useful for the anesthetic management for patients with underlying respiratory conditions who underwent breast cancer resection. In future, it may be necessary to experience the anesthesia of similar case and confirm that our method is useful and safe for the anesthesia for patients with low respiratory function.

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AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

KE, NO, TY and SH managed the patients' anesthesia and drafted this manuscript. KF also managed the patients' anesthesia. SH and SY provided substantial advice for the preparation and revision of the manuscript.

All authors have reviewed and approved the final manuscript.

CONFLICTS OF INTEREST

None.

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